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## 1NC Solvency 1/2

### First, Current launch barriers prevent solvency- Can’t build

Vision Spaceport Partnership, 2k (Final Report to the NASA Solar Power Exploratory Research and Technology Program, Spaceport Concept and Technology Roadmapping)

The concept of collecting solar energy in space through orbiting platforms and transmitting that energy to Earth for providing electrical power is one possibility for providing clean, affordable energy for global needs in the 21st century. The realization of this concept, as well as multitudes of unimagined ideas, is constrained by a space transportation infrastructure that is costly and ineffectual for such large-scale enterprises. Recurring launch costs in the range of $100-$200 per kilogram delivered to orbit are required to enable such business endeavors. It is clear that space transportation is the bottleneck that currently constrains space enterprises to the imaginable.

### Second, ASATs and terrorists will take out SPS

Pop, PhD candidate at the University of Glasgow, 2k (Virgiliu, “Security Implications of Non-Terrestrial Resource Exploitation”, <http://www.spacefuture.com/archive/security_implications_of_non_terrestrial_resource_exploitation.shtml>)

The use of a geosynchronous orbit makes the SPS “a “sitting duck” for anti-satellite weapons”, given “the absolute predictability of these orbits”40. Its vulnerability is of high importance, “especially since it could be supplying a large portion of a nation’s electricity”41. Security issues are raised also by the ground-based rectenna that “would be as vulnerable to terrorist or quasi-military action as other large industrial complexes or power plants”42.

### Third, SPS can’t solve energy crisis- Transition is too long

O’Neil, International Institute for Applied Systems Analysis, 2k3 (Brian, April 25th, “Planning for Future Energy Resources”, Science, Vol. 300)

Second, we doubt whether the development and implementation of the radically new technologies such as fusion or solar power satellites advocated in the article are feasible within the time horizon necessary for C[O.sub.2] stabilization. The process from invention, to demonstration projects, to significant market shares typically takes between five and seven decades (3). Fundamentally new technologies that have not been demonstrated to be feasible even on a laboratory scale today would therefore likely come much too late to contribute to the emissions reductions necessary by 2050, particularly for stabilization at 450 ppmv or below (4). We believe that the appropriate mix of investments must include an initial focus on technologies with proven feasibility if we are to embark on a path to stabilization. At the same time, we should begin to explore new energy sources that might then be available in the long term to finish the job.

### Fourth, SPS won’t replace fossil fuels- We’ll use both- Causes catastrophic ecosystem damage

Space Colonization.com, Accessed 2k4 (Staff, “Solar Powered Satellites”, p. online: http://www.spacecolonization.com/SPS.htm)

The negatives to this technology are many. One, the satellites would be brighter objects than any star or planet, which would heavily limit ground-based astronomy anywhere near the satellites. Second, the dense microwave beam that is used to transmit the power to Earth must remain focused on the receiver array at all times. The damage that such a system could do if it drifted off-target (into a building, for example), is horrifying. Finally, though it would probably be environmentally preferable to burning fossil fuels to generate our electricity, there is no guarantee that we would not just continue to use the fossil fuel plants in addition to the SPS system in order to satisfy our limitless energy demands. SPS power is not without environmental drawbacks of its own (since we are adding energy to the closed system that is the Earth), and to combine that with the continued damage of rampant fossil fuel use would be catastrophic.

1NC Solvency 2/2

### SBSP would be hard to maintain in space

Mankin, co-founder and Chief Operating Officer of Managed Energy Technologies LLC, and President of the Space Power Association, 2008, (John C., Adastra, “Space-Based Solar Power Inexhaustible Energy From Orbit”, http://www.nss.org/adastra/AdAstra-SBSP-2008.pdf, DOA: 7/25/11)

A major barrier to all space endeavors also applies to space solar power, and that is affordable access to space. This barrier is one of compelling importance. The problem of space access includes both low-cost and highly-reliable Earth-to-orbit transportation, and in-space transportation. (Fortunately, one of the key ingredients in overcoming this barrier is having a market that requires many flights. It’s hard to imagine how air travel between continents would be affordable if the aircraft were used once or twice per year rather than once or twice per day!) Advances that drive down the cost of space operations present significant hurdles, too. These hurdles involve a range of capabilities, most of which have never been demonstrated in space—but all of which are entirely taken for granted here on Earth. The kinds of capabilities in question include the highly-autonomous assembly of large structures, the deployment and integration of modular electronic systems, refueling, and repair and maintenance. (The key ingredient is to perform such operations without large numbers of operators and sustaining engineers on Earth—which drive the high cost of contemporary space operations.)

## 1NC Terrestrial Alt Energy Turn

### Funding SSP trades off with more viable terrestrial alternative energy programs

Gibbons, Director of the OTA, 81 (John, “Solar Power Satellites,” NTIS order #PB82-108846, August)

Opponents of SPS characteristically support terrestrial solar and “appropriate” technologies and are often concerned about environmental issues. The Solar Lobby40 41 and the Environmental Policy Center,42 for example, fear that an SPS program would drain resources and momentum from small-scale, ground-based, renewable technologies. They argue that compared to the terrestrial solar options, SPS is inordinately large, expensive, centralized, and complex and that it poses greater environmental and military risks. The Citizen’s Energy Project has been the most active lobbyist against funding SPS and has coordinated the Coalition Against Satellite Power Systems, a network of solar and environmental organizations. 43 Objections to SPS also have been raised by individuals in the professional astronomy and space science communities that see SPS as a threat to the funding and practice of their respective disciplines.44 45 While there is a wide spectrum of support for SPS in the advocates’ community, ranging from cautious support of continued research to great optimism about the concept viability and deployment, almost all opponents object to Government funding of SPS research, development, and deployment. If the SPS debate continues in the future, it is likely that several other kinds of groups would take a stand on SPS.46 For example, antinuclear groups could oppose SPS on many of the same grounds that they object to nuclear power: centralization, lack of public input, and fear of radiation, regardless of kind. Antimilitary organizations might also object to SPS if they foresaw military involvement. It is likely that community groups would form to oppose the siting of SPS receivers in their locality if the environmental and military uncertainties were not adequately resolved or if public participation in the siting process was not solicited. Rural communities and farmers in particular could also strongly oppose SPS on the grounds that, like highways and high-voltage power- Iines, it would intrude on rural life. Issues The issues that repeatedly surface in the SPS debate are shown in table 53. It should be noted that in most of the discussion, it is assumed that SPS would be a U.S. project (at least in the near term). If the question of SPS were posed in an international context, it is possible that the flavor of the following arguments wouId be altered considerably. Currently, public discussion is focused on the question of R&D funding. It is anticipated that as public awareness grows, the environmental, health, safety, and cost issues will receive more public attention. Questions of centralization, military implications and the exploitation of space could also be important. R&D PROGRAMS The primary purpose of an SPS R&D program in the near term would be to keep the SPS option open. However, opponents argue that it makes little sense to investigate this complex, high risk technology when other more viable alternatives exist to meet our future energy needs.47 In particular, they fear that SPS would divert funds and valuable human resources from the terrestrial solar technologies, which they perceive as more environmentally benign, versatile, less expensive to develop, and commercially available sooner than SPS.48 Opponents also argue that a Government R&D program for SPS would fall easy prey to bureaucratic inertia, and that no matter what the results of R&D, the program would continue because the investment and attendant bureaucracy would be too great to stop. 49 Moreover, opponents believe that political inertia will be generated from the relatively large amount of money that is presently allocated to organizations with a vested interest in SPS as compared to those groups opposed to SPS. In addition, they are concerned that studies evaluating SPS for the purpose of making decisions about R&D funding do not compare SPS with decentralized solar technologies; they argue that without this kind of analysis, the public would be unwilling to make a commitment to SPS funding. Advocates, on the other hand, view SPS as a potentially viable and preferable technology. so They argue that an R&D program is the only means of evaluating SPS vis-a-vis other energy technologies. Moreover, if the Nation can afford to spend up to $1 billion per year on a high-risk technology like fusion, it could certainly afford SPS research that would be much less expensive. 51 proponents maintain that SPS research will yield many spinoffs to other technologies and research programs whether or not SPS is ever deployed. 52 53 They also respond to claims of bureaucratic inertia by citing several cases in which large projects, such as the SST and the Safeguard ABM system, were halted in spite of the large investment. 54 They argue that at the funding levels currently discussed for R&D, the risk of program runaway is very low. COST Economic issues have played center stage in the SPS debate. Almost every journal account of SPS (particularly those critical of the satellite) has highlighted its cost.55 56 57 The predominant questions revolve around R&D priorities and capital and opportunity costs. In addition, the calculation of costs themselves and cost comparisons between technologies could be subject to extensive scrutiny and debate. Proponents argue that the only cost open for public discussion is the cost of RD&D to the taxpayer. 5859 The bulk of the SPS investment would be carried on by the private sector in competition with other inexhaustible energy alternatives. Furthermore, much of the RD&D cost could be returned from other space programs such as nonterrestrial mining and industrialization that build upon the SPS technological base. ’” Advocates also contend that an SPS program would produce economic spinoffs by providing domestic employment and by stimulating technological . innovation for terrestrial industry.61 Some proponents also argue that as an international system, SPS could lead to the expansion of world energy and space markets. 62 63 In addition, in a global scenario, the United States would bear a smaller portion of the development costs. Finally, advocates believe that in spite of the large investment costs, SPS would be economically competitive with other energy technologies. 64 65 Opponents argue that the present cost estimates are unrealistically low.66 They expect that like other aerospace projects and the Alaskan pipeline, the cost of SPS would significantly increase as SPS is developed. Furthermore, the U.S. taxpayers would be required to support this increase and to maintain an ongoing commitment to SPS above and beyond the RD&D costs, just as they have for the nuclear industry. ” The National Taxpayers Union, in particular, sees SPS as a “giant boondoggle that will allow the aerospace industry to feed its voracious appetite from the federal trough.”68 Opponents argue that SPS would not alleviate unemployment substantially because it provides unsustainable jobs to the aerospace sector alone.69 Most opponents also do not believe that SPS will be cost competitive and argue that the amount of energy produced by SPS would not justify its large investment cost. 70 The most critical issue for opponents is the question of opportunity cost, i.e., the cost of not allocating resources for other uses.71 They argue that a commitment to SPS R&D would jeopardize rather than stimulate the development of other energy technologies. Opponents also argue that SPS might foreclose opportunities for alternate land use, Federal non energy R&D funding, allocation of radio frequencies and orbital slots, resource uses and jobs

## 2NC Terrestrial Alt Energy Turn

### And, There is a zero sum tradeoff between incentives for space solar power and terrestrial alternative energy technologies.

Bachrach, of the Environmental Resources Group of the PRC Energy Analysis Company, 10-78 (Arrie, “Satellite Power System (SPS): Public Acceptance,” prepared for the Department of Energy Office of Energy Research Satellite Power System Project Office for the DOE/NASA SATELLITE POWER SYSTEM Concept Development and Evaluation Program)

Along with microwaves, program cost issues are the most commonly expressed concern about the SPS program. The total capital investment in developing SPS is recognized as **extremely large** by advocates and opponents alike, although advocates emphasize the fact that the size of the SPS investment must be compared to the massive investment required to generate equivalent amounts of energy by alternative means. Further, SPS opponents are skeptical about the cost estimates thus far developed, feeling that they underestimate the ultimate development cost. The uncertainties inherent in long-range predictions of costs render these estimates "ridiculous" (165) "There is nothing that they (the space industry) propose that does not end up being twice to three times more expensive than their estimates." (3G) Beyond the total number of dollars required, SPS critics emphasize the size of the ''up front" investment -- the dollar (and energy) commitment that would be required before any energy and, revenue would be produced. The assertion that an operational SPS system would produce large profits is disputed as unrealistic, and is compared to the overly optimistic "projections made two decades ago for nuclear power" (138); the projection that the cost of SPS-generated electricity will be competitive also is questioned (76). However, the most common cost-related concern, which was expressed by almost every solar/environmentalist organization contacted, is the fear that SPS will drain a large proportion of the limited resources that could otherwise be spent on R&D and commercialization of decentralized terrestrial solar technologies. As a staff member of the Solar Lobby put it, "we can’t afford to develop SPS and at the same time do the other things that need to be done" (173). Put another way, "every dollar spent on solar satellites will not be spent on terrestrial solar research and commercialization(36). This argument about financial priorities, is directly related to other arguments about energy priorities that will be discussed later.

## 1NC Fires Turn 1/2

### SPSB will concentrate sunlight, increasing chance of skin cancer and fire

Simanek, 98 (Donald E. Simanek, Lock Haven University, “The Hazards of Solar Energy,” 1998, <http://www.lhup.edu/~dsimanek/solar.htm>)

This process operates on the very same basic laws of nuclear physics used in nuclear power plants and atomic bombs! And what is the source of this energy? It is hydrogen, a highly explosive. Hydrogen is also the active material in H-bombs that are not only tremendously destructive, but produce dangerous fallout. The glib advocates of solar energy don't even mention these disturbing facts about the true sources of solar energy. What else are they trying to hide from us? In addition to the known dangers cited above, what about the unknown dangers, that very well might be worse? When pressed, scientists will admit that they do not fully understand the workings of the sun, or even of the atom. They will even grudgingly admit that our knowledge of the basic laws of physics is not yet perfect or complete. Yet these same reckless scientists would have us use this solar technology even before we fully understand how it works. Admittedly we are already subject to a natural `background' radiation from the sun. We can do little about that, except to stay out of direct sunlight as much as possible. The evidence is already clear that too much exposure to sunlight can cause skin cancer. But solar collectors would concentrate that sunlight (that otherwise would have fallen harmlessly on waste land), convert it to electricity and pipe it into our homes to irradiate us from every light bulb! We would then not even be safe from this cancer-producing energy even in our own homes! We all know that looking at the sun for even a few seconds can cause blindness. What long term health hazards might result from reading by light derived from solar energy? We now spend large amounts of time looking at the light from television monitors or computer screens, and one can only imagine the possible long-term consequences of this exposure when the screens are powered with electricity from solar collectors. Will we develop cataracts, or slowly go blind? Not one medical study has yet addressed itself to this question, and none are planned. In their blind zeal to plug us in to solar energy, scientists seem to totally ignore possible fire hazards of solar energy. Sunlight reaching us directly from the sun at naturally safe levels poses little fire threat. But all one has to do is concentrate sunlight, with a simple burning- glass, and it readily ignites combustible materials. Who would feel safe with solar energy concentrators on their roof? Could we afford the fire insurance rates?

### Mega-firestorms will spread globally, burning out of control

TAYLOR 2007 Reuters 1/19/07

CANBERRA AUSTRALIA , Jan 19 (Reuters) - They burn like fire hurricanes on fronts stretching sometimes thousands of kilometres and with a ferocity that explodes trees and makes them impossible to extinguish short of rain or divine intervention. Bushfires like those which have raged through Australia's Southeast for two months and which struck Europe, Canada and the western United States in 2003 are a new type of "megafire" never seen until recently, a top Australian fire expert said on Friday. "They basically burn until there is a substantial break in the weather, or they hit a coastline," Kevin O'Loughlin, chief executive of Australia's government-backed Bushfire Cooperative Research Centre, told Reuters. "These fires can't be controlled by any suppression resources that we have available anywhere in the world."

1NC Fires Turn 2/2

### Mega-fires upset the global carbon balance

LAZAROFF 2002 Environment News Service 11/8/

http://www.ens-newswire.com/ens/nov2002/2002-11-08-06.asp

But the problem did not end with the easing of the dry El Niño weather pattern. Wildfires, mostly sparked by humans clearing forest for agriculture, and exacerbated by increased logging in the years following the fires, caused major problems again in 2000, and problems may be cropping up again this year. These fires destroy some of the habitat on which a variety of endangered species, such as bears, elephants, rhinos, tigers and orangutans, depend. Birute Galdikas, a primatologist who began her orangutan research in 1971, said the number of orangutans in Indonesian Borneo has been halved in the past decade, partly due to the fires as well as logging and mining. But besides the catastrophic effects that tropical wildfires may have on biodiversity, researchers must consider the impact that relatively small areas of fire may have on the planet as a whole, through their contributions to global climate change. Natural, undamaged peat swamp forest is "essential to maintain high water levels, protect the peat carbon store and facilitate future carbon sequestration from the atmosphere," the researchers conclude. That position is echoed by an essay that accompanies the "Nature" article, written by two scientists from the U.S. National Center for Atmospheric Research. The researchers, David Schimel and David Baker, note that Susan Page and her colleagues have shown that "abrupt events can have an appreciable effect on the carbon cycle." "Most observing systems and modeling strategies assume that, to affect the carbon cycle, processes must occur over thousands of square kilometers or more," they write. "But especially in areas of high carbon density, catastrophic events affecting small areas can evidently have a huge impact on the global carbon balance."

### Extinction

SCIENCE DAILY 2008 5/29

http://www.sciencedaily.com/releases/2008/05/080528140255.htm

"Our findings document an abrupt and catastrophic means of global warming that abruptly led from a very cold, seemingly stable climate state to a very warm also stable climate state with no pause in between," said Martin Kennedy, a professor of geology in the Department of Earth Sciences, who led the research team. "This tells us about the mechanism, which exists, but is dormant today, as well as the rate of change," he added. "What we now need to know is the sensitivity of the trigger: how much forcing does it take to move from one stable state to the other, and are we approaching something like that today with current carbon dioxide warming." Study results appear in the May 29 issue of Nature. According to the study, methane clathrate destabilization acted as a runaway feedback to increased warming, and was the tipping point that ended the last snowball Earth. (The snowball Earth hypothesis posits that the Earth was covered from pole to pole in a thick sheet of ice for millions of years at a time.) "Once methane was released at low latitudes from destabilization in front of ice sheets, warming caused other clathrates to destabilize because clathrates are held in a temperature-pressure balance of a few degrees," Kennedy said. "But not all the Earth's methane has been released as yet. These same methane clathrates are present today in the Arctic permafrost as well as below sea level at the continental margins of the ocean, and remain dormant until triggered by warming. "This is a major concern because it's possible that only a little warming can unleash this trapped methane. Unzippering the methane reservoir could potentially warm the Earth tens of degrees, and the mechanism could be geologically very rapid. Such a violent, zipper-like opening of the clathrates could have triggered a catastrophic climate and biogeochemical reorganization of the ocean and atmosphere around 635 million years ago." Today, the Earth's permafrost extends from the poles to approximately 60 degrees latitude. But during the last snowball Earth, which lasted from 790 to 635 million years ago, conditions were cold enough to allow clathrates to extend all the way to the equator. According to Kennedy, the abruptness of the glacial termination, changes in ancient ocean-chemistry, and unusual chemical deposits in the oceans that occurred during the snowball Earth ice age have been a curiosity and a challenge to climate scientists for many decades. "The geologic deposits of this period are quite different from what we find in subsequent deglaciation," he said. "Moreover, they immediately precede the first appearance of animals on earth, suggesting some kind of environmental link. Our methane hypothesis is capable also of accounting for this odd geological, geochemical and paleooceanographic record." Also called marsh gas, methane is a colorless, odorless gas. As a greenhouse gas, it is about 30 times more potent than carbon dioxide, and has largely been held responsible for a warming event that occurred about 55 million years ago, when average global temperatures rose by 4-8 degrees Celsius. When released into the ocean-atmosphere system, methane reacts with oxygen to form carbon dioxide and can cause marine dysoxia, which kills oxygen-using animals, and has been proposed as an explanation for major oceanic extinctions.

## 2NC Fires Turn

### SBSP could be used to cause fires

Pop, 2K (Virgiliu, LL.Lic, LL. PhD Student, Law School, University of Glasgow “Security Implications of Non-Terrestrial Resource Exploitation” Paper presented at the 43rd Colloquium on the Law of Outer Space.  51st International Astronautical Congress, Rio de Janeiro, 6 October 2000, Proceedings of the 43rd Colloquium on the Law of Outer Space, pp. 335-345.

http://www.spacefuture.com/archive/security\_implications\_of\_non\_terrestrial\_resource\_exploitation.shtml)

Although of a non-lethal nature [10], the effects of electromagnetic weapons are significant, ranging from "nuisance to catastrophic"[11]. This led experts to consider them as "Weapon[s] of Electrical Mass Destruction"[12]. Indeed, the reliance of today's society on electronic and computer systems makes it extremely fragile; a HPM attack would have far more catastrophic effects than the Millennium Bug[13]. Another "mass destruction-like" effect may be presented by the SPS that would use lasers instead of microwaves as means of transmission of energy and that may also have the capacity to cause catastrophic fires on enemy territory. Gerrard and Barber note that "there is some debate as to whether nuclear-powered lasers are [weapons of mass destruction]"[14]. The same may be true in the case of use of orbiting solar mirrors: it may "become technically feasible to concentrate solar energy in certain areas of the earth and thereby cause fires, scorch the earth, or cause floods"[15]. Precedents of the use of solar rays as a weapon exist as far back as the 3rd Century BC, when Archimedes is said to have put fire to the Roman fleet invading Syracuse by using solar rays concentrated by mirrors.

## 1NC Ozone Layer Turn

### SBSP energy waves can damage the earth’s atmosphere

Bansal, PhD at U of W, Assistant professor of Management Information Systems, 5/23, (Gauray, EcoFriend, “The Good, The Bad, and The Ugly Space Based Solar Energy”, <http://www.ecofriend.com/entry/the-good-the-bad-and-the-ugly-space-based-solar-energy/>, DOA: 7/25/11)

2.Laser beam penetration:

Transmission of energy through atmosphere has not yet been done at a large scale and its successful commercial utilization is still under question. The ionosphere, the electrically charged portion of the atmosphere, will be a significant barrier to transmission.

pagation can be very dangerous and may lead to increase in radioactivity in earth’s environment.

Insert Greenpeace ’95!!!

## 1NC SBSP Politics Links

### Plan requires significant investment of political capital

National Security Space Office, 2k7 (Oct 10th, Report by NSSO’s Advanced Concepts Office in conjunction with the world’s top 170 SBSP experts, “Space-Based Solar Power As an Opportunity for Strategic Security”, <http://www.nss.org/settlement/ssp/library/nsso.htm>)

Space‐Based Solar Power is not a small project, but might be considered comparable in scale to the national railroads, highway system, or electrification project than the Manhattan or Apollo endeavors. However, unlike such purely national projects, this project also has components that are analogous to the development of the high‐volume international civil aviation system. Such a large endeavor carries with it significant international and environmental implications and so would require a corresponding amount of political will to realize its benefits.

## 2NC SBSP Unpopular 1/3

### Positioning SSP as an alternative energy drains political capital- It’s not seen as cost-effective

Boswell, speaker at the 1991 International Space Development Conference, 2k4 (David, Aug 30th, “Whatever happened to solar power satellites?”, The Space Review, <http://www.thespacereview.com/article/214/1>)

Another barrier is that launching anything into space costs a lot of money. A substantial investment would be needed to get a solar power satellite into orbit; then the launch costs would make the electricity that was produced more expensive than other alternatives. In the long term, launch costs will need to come down before generating solar power in space makes economic sense. But is the expense of launching enough to explain why so little progress has been made? There were over 60 launches in 2003, so last year there was enough money spent to put something into orbit about every week on average. Funding was found to launch science satellites to study gravity waves and to explore other planets. There are also dozens of GPS satellites in orbit that help people find out where they are on the ground. Is there enough money available for these purposes, but not enough to launch even one solar power satellite that would help the world develop a new source of energy? In the 2004 budget the Department of Energy has over $260 million allocated for fusion research. Obviously the government has some interest in funding renewable energy research and they realize that private companies would not be able to fund the development of a sustainable fusion industry on their own. From this perspective, the barrier holding back solar power satellites is not purely financial, but rather the problem is that there is not enough political will to make the money available for further development. In the long term, launch costs will need to come down before generating solar power in space makes economic sense. But is the expense of launching enough to explain why so little progress has been made? There is a very interesting discussion on the economics of large space projects that makes the point that “the fundamental problem in opening any contemporary frontier, whether geographic or technological, is not lack of imagination or will, but lack of capital to finance initial construction which makes the subsequent and typically more profitable economic development possible. Solving this fundamental problem involves using one or more forms of direct or indirect government intervention in the capital market.”

### Everyone doubtful about Solar Energy

LA Times, 6/27/2005, [“Governor’s Solar Plan Is Generating Opposition”, http://articles.latimes.com/2005/jun/27/business/fi-solar27]

Gov. Arnold Schwarzenegger’s plan to spend billions of dollars to put electricity-producing solar panels on a million California rooftops could be running into stormy weather. For the second year running, the governor is sponsoring legislation that would put photovoltaic solar systems at the head of the line for the bulk of state alternative energy funding .For Schwarzenegger and his backers in the environmental community and the solar industry, a massive push to use abundant “free power” from the sun is an easy call. Schwarzenegger is thinking big: He wants to increase the state’s total solar output from about 101 megawatts to 3,000 megawatts by 2018. That’s enough nonpolluting power to run about 2.25 million homes and eliminate the need to build six large natural gas-fired generating plants. But the bill, despite such high-profile backing and a bipartisan 30-5 vote in the state Senate is facing potential difficulties in the Assembly. Opposition from business lobbies, utilities, unions and even consumer groups is setting the stage for what could be a close vote. The first hint of how the bill will fare in the Assembly is expected to come today when it faces its first hearing in the Assembly Utilities and Commerce Committee. Most of the complaints about the governor’s solar program center on its estimated 10-year, $2-billion-to-$3-billion price tag. Much of that would be paid by power users in the form of surcharges imposed by the California Public Utilities Commission. Proponents estimate that the annual rate hike would be about $15 per residential customer. But business groups – usually among Schwarzenegger’s staunchest supporters – complain that increases for large power users such as big-box retailers and industrial operations would be much higher – a key point in a state that already has the highest electricity rates in the continental United States. The governor’s solar plan is “so expensive that it’s not cost-effective,” said Joseph Lyons, an energy lobbyist for the California Manufacturers and Technology Assn. “Our members need rate relief, and this goes in the other direction,” Lyons said. Southern California Edison Co., the state’s second-largest investor-owned utility, is also skeptical, saying the governor’s bill favors rooftop solar systems over what it says are more cost-effective centralized solar generating stations. Even fans of solar power– who view photovoltaic panels as a crucial part of the state’s alternative energy mix – question the wisdom of earmarking the bulk of funding for one source, to the detriment of less-glamorous energy efficiency and conservation programs. “Solar is not even close to competitive,” said Severin Borenstein, director of the University of California Energy Institute in Berkeley. He noted that solar power’s long-run, average production cost of 25 cents to 30 cents per kilowatt hour, not including government subsidies or tax credits, is much higher than the 5 cents to 9 cents for wind power and 6 cents to 7 cents for modern, natural-gas-fired generation plan

2NC SBSP Unpopular 2/3

### Energy lobby will block the plan- They empirically kill SSP support

Nansen, led the Boeing team of engineers in the Satellite Power System Concept Development and Evaluation Program for the Department of Energy and NASA, and President Solar Space Industries, 1995 (Ralph, Sun Power, http://www.nss.org/settlement/ssp/sunpower/sunpower02.html)

The time finally arrived when the DOE/NASA contracts were completed and we all assembled in Lincoln, Nebraska, in April of 1980 to report on the results of the numerous studies. Represented were over 200 different organizations: the major aerospace companies and their subcontractor teams, the Environmental Protection Agency and their research scientists from universities and research institutes, concerned citizen groups representing organizations supporting the concept and groups opposing its development, research scientists from technology development companies, and economists. All had been included in the $19.5 million evaluation studies. The conclusion of the conference was that there was no technical reason why the satellite system should not be developed and that the potential benefits were very promising. There should have been a great festive atmosphere of triumph, for the results of the studies radiated success and optimism. Instead it was like a funeral. The ax of doom hung over the proceedings. There would be no follow-on work. The contract reports were to be submitted to the Department of Energy, and at their direction, there would to be no release of the reports to the public. A new energy system was a serious threat to ongoing funding for nuclear research. The administration and the DOE wanted us out of the picture. I had been very naive to believe we could develop a new energy system that would displace coal and oil and eliminate the need for nuclear power, just because it was the best system and it would be good for the country. The opposition lined up against us was overwhelming. They were too powerful. The forces of greed had won. America and the world would suffer the consequences for years to come.

### Framing SSP as an alternative energy spurs a massive political battle- History proves

Preble, President of the Space Solar Power Institute, 2k6 (Darel, Dec 15th, “Introduction to the motion to the National Space Society Board of Directors,” http://www.sspi.gatech.edu/sunsatcorpfaq.pdf)

Changing our nation and our world’s baseload energy generation sources to introduce SSP is a massive battle. The current oil, coal, and gas energy providers, nuclear as well, are not eager to see their baseload investments face competition from SSP, which has zero fuel costs and zero emissions and a billion years of steady supply projected. This is why SSP has been unfunded since it was invented in 1968. Carter pushed through the SSP reference study in 1979-1980, but space transportation costs were far too high, and they were forced to plan to use astronauts to bolt it together. This is too dangerous for astronauts outside the protection of the Van Allen Radiation Belts. (The Space Station is inside the Van Allen Belts) People are also too expensive to use for SSP construction. Telerobotics, the real way to assemble SSP, did not exist in 1979. Now it is used in heart surgery every day worldwide and for a thousand other uses. (The fossil fuel industry has battled environmentalists every inch during our struggle to understand climate change effects. That is their right. Perhaps half the studies are wrong. But half are right.) Most crucially, space transportation costs have stayed too high because there is no market large enough to support a Reusable Launch Vehicle fleet. SSP IS just such a massive market. Robert Zubrin mentions this battle and perspective in “Entering Space”, page 51. He quit space transportation and decided to work on Mars, which has no possibility of commercialization this century. This is detailed in the Space Transportation chapter on the SSPW website also. You can’t make an omelet without breaking a few eggs.

### Tea Party hates the idea of green energy

Sinclair (Peter, longtime advocate of environmental awareness and energy alternatives) Are your Solar Panels Breeding Bolsheviks? Tea Party Congress targets National Renewable Energy Lab (NREL) June 5, 2011 <http://climatecrocks.com/2011/06/05/tea-party-congress-new-target-national-renewable-energy-lab-nrel/>

The Tea Party congress hates new energy, hates the idea that the nation could be weaned off its oil dependence, or fossil fuels. They hate renewable energy because their primary sponsors in the fossil fuel industry want above all to slow progress on that front, and drag the nation back into the 19th century.

2NC SBSP Unpopular 3/3

### SSP can’t be sold as a power system - Coal and oil lobbies will attack it

Glaser, Aerospace Engineer, Vice President of Arthur D. Little- the world’s largest consulting firm, 2k8 (Peter, Spring, “An energy pioneer looks back”, Interviewed by Ad Astra, Interview, http://www.nss.org/adastra/AdAstra-SBSP-2008.pdf)

Ad Astra: In light of the growing demand for dwindling hydrocarbons and the dangerous increases of greenhouse gases, do you think that the world is now primed to seriously consider space-based power systems? Glaser: No, because people can still get gas for their cars too easily. Those in the top levels of science and government know what is coming, but the average man on the street will not care unless it impacts his wallet. That is the biggest problem. The basic approach is unchanged from my initial concept. We could have built this system 30 years ago. The technology just keeps getting better. The design and implementation is a small problem compared to the much larger obstacle of getting people to understand the potential benefits. Building such a system could provide cheap and limitless power for the entire planet, yet instead of trying to find a way to make it work, most people shrug it off as being too expensive or too difficult. Of course existing energy providers will fight, too. It only makes sense that coal and oil lobbies will continue to find plenty of reasons for our representatives in Congress to reject limitless energy from the sun.

### And, SSB lobby is worthless- Congress isn’t receptive

CongressNow, 2k7 (Aug 9th, Note: Mankins = head of NASA’s SSP Study, Hoffert = Prof of Physics at NYU, “Space Energy Advocate See Security, Climate Concerns as Potential Opening”)

Mankins also said the technology offers opportunities for a wide range of markets. However, he noted that support for space-solar power in Congress has been limited to individual Members. "It's an unusual topic," he said, acknowledging that its advocates are "not particularly well-organized." Hoffert agreed. "We haven't been successful in conveying these ideas to Congress," he said.

### And, Zero chance in current political climate

Arnold, systems architect and engineer with Silverton Engineering, 2k6 (Roger, comments in response to “NASA - Wrong mission for the right stuff,” ttp://www.energypulse.net/centers/article/article\_display.cfm?a\_id=1285)

Having worked at Boeing in the '70s and hung out with the guys who did Boeing's study on SPS, I'm much more receptive to the idea than the average Joe is likely to be. I know it's technically feasible, at some level. But even I have trouble swallowing the idea of a crash program to build solar power satellites as a solution to CO2 emissions. In today's political climate, it has a 0% chance of getting enacted. A massive nuclear energy program would be a lot more credible, and easier to sell. The only way solar power satellites are likely to get built is if a viable commercial space industry manages to establish itself first. Launch traffic needs to be ramped up, costs brought down, and operations in space made sufficiently commonplace that the leap to SPS is not so much of a leap. That could happen, and I have some ideas about how, but it won't be easy. It certainly can't happen as long as NASA is blocking the road.

### And, SSP’s uncoordinated support isn’t enough in Congress

**Aerospace Daily and Defense Report, 2k7 (Aug 9th, “Space Solar Power Has ‘Fallen Through the Cracks”)**

But the problem of gaining the necessary backing remains. Both experts said the concept enjoys "uncoordinated" support on Capitol Hill, with individual members of Congress intrigued by the idea but without the broad support it would need to get under way. Within the federal agencies with potential SSP roles, the Energy Department "culture" isn't conducive to large aerospace projects, Hoffert said, while NASA killed the SSP research effort Mankins was heading because "we don't do energy at NASA."

## 2NC SBSP Drains PolCap

### The President will have to push the plan- That’s a huge political commitment

Nansen, led the Boeing team of engineers in the Satellite Power System Concept Development and Evaluation Program for the Department of Energy and NASA, and President Solar Space Industries, 1995 (Ralph, Sun Power, http://www.nss.org/settlement/ssp/sunpower/sunpower02.html)

A logical approach for a concept this large is for the federal government to fund the development as a national resource. This has been done often in the past and is one of the normal functions of government. However, government development of solar power satellites will only be successful if the President of the United States supports it, as did President Kennedy in sending men to the moon and President Eisenhower when he proposed the interstate highway system. For this alternative to work it must be a total commitment, made without hollow political gesture or reservation. It is an enormous and challenging task that will not succeed with half-hearted efforts. It will require long-term support with sufficient funds to carry the program through the inevitable hard times that will occur as development progresses.

## 1NC Proliferation Link

### And, The link is guaranteed – Other nations will watch how the SSP is funded and owned. They’ll perceive the plan as an attempt to build offensive space weapons.

Gibbons, Director of the OTA, 81 (John, “Solar Power Satellites,” NTIS order #PB82-108846, August)

The potential military aspects of an SPS will be of major concern to the international community and to the general public. There are fears that the satellite will be vulnerable to attack, or that it may be used for offensive weapons (see ch. 9, Public Opinion). Such concerns may be decisive in determining the pace and scope of SPS development, and the mode of financing and ownership that is used. There are three basic aspects to consider: 1) SPS vulnerability and defensibility; 2) the military uses of SPS launch vehicles and construction facilities; and 3) direct and indirect use of SPS as a weapons system or in support of military operations. Of these it is the second, the extensive capability of new launchers and large space platforms, that will constitute the most likely and immediate impact. Vulnerability and Defensibility There are two main segments of any SPS, the ground receiver and the satellite proper. Since reference-system rectennas or mirror-system energy parks would be very large and composed of numerous identical and redundant components, they would be unattractive targets; the smaller antennas of other designs would be slightly more vulnerable. The satellite segment would be vulnerable in the ways outlined below, but in general no more so than other major installations. Its size and distance would be its best defenses. Would SPS Be Attacked? The reasons for attacking a civilian SPS would be that it is expensive and prestigious, not easily replaceable, and that it supplies an essential commodity, baseload electricity. In determining whether to target an SPS in the event of hostilities, the crucial consideration would be how much of a nation’s or region’s electricity is supplied by SPS. In most developed countries, utilities maintain a reserve of approximately 20 percent of their total capacity, in order to guard against breakdowns and maintenance outages. If SPS supplied no more than the reserve margin, its loss could be made up; however, given an SPS system consisting of many satelIites particular regions or industries would be Iikely to receive more than 20 percent. Making up for losses would require an efficient national grid to transfer power to highly affected areas. Increased use of high voltage transmission lines and other measures should increase U.S. ability to transfer power. However, in many countries, especially LDCs, SPS losses might not be easily replaceable since SPSs, if used, would be likely to provide more than 20 percent of total capacity on a national basis. An attack on SPS would also depend on other factors. If the attacker relies on its own SPSs, it may fear a response in kind. If the satellites were owned by a multinational consortium the attacker might be hesitant to offend neutral or friendly states involved. If they were manned— it is unclear whether permanent personnel would be required for SPS — the attacker might be reluctant to escalate a confIict by attacking manned bases. The unprecedented position of the SPS, located in orbit outside of national territory, gives rise to uncertainties as to how an attack would be perceived and responded to. If the SPS is seen as analogous to a merchant ship on the high seas, attacks would be proscribed unless war were declared and outer space were proclaimed a war zone. Otherwise, any attack would be tantamount to a declaration of war. In practice, however, experience has shown that attacks on merchant vessels have not caused an automatic state-of-war, though they have often played a crucial part in bringing one about. It is more likely that the SPS, because of its function and/or its stationary position (for certain designs), would be perceived as similar to a fixed overseas base or port rather than a ship. An attack would then be taken more seriously, especially if lives were lost. It will be important for national leaders to clarify what status an SPS would have, particularly in times of crisis. A low priority assigned to SPS could encourage enemy states to attack it as a way of demonstrating resolve or as part of an escalator response short of all-out war. How Could SPS Be Attacked? There are essentially five ways the satellite portion of an SPS could be destroyed or damaged: 1) ground-launched missiles; 2) satellites or space-launched missiIes; 3) ground or spacebased directed-energy weapons; 4) orbital debris; 5) disruption or diversion of the energy transmission beam. A missile attack from the ground on a geosynchronous SPS would have the disadvantage of lack of surprise, due to the distances involved and the satellite’s position at the top of a 35,000 km gravity well; missiles would take up to an hour or more to reach, geosynchronous orbit. An attack from prepositioned geosynchronous satellites would be faster and less detectable. However, a laser or mirror SPS in low orbit could be reached from the ground in a matter of minutes. Lasers or particle beams, which might be used to rapidly deface the solar celIs or mirrors rather than to cause structural demage, would have virtually instantaneous effect. Placing debris in SPS’s orbital path, but moving in the opposite direction —such as sand designed to degrade PV cells or mirrors– would have the disadvantage of damaging other satellites in similar orbits, and of making the orbit permanently unusable in the absence of methods to ‘sweep’ the contaminated areas clean. The relative ease and simplicity of this method, however, could make it attractive to terrorists or other technically unsophisticated groups. Any explosive attack could have similar drawbacks, although since the resultant debris would be traveling in the same direction as most other satellites (which move with the Earth’s rotation) the ensuing damage would be SIight. If technically feasible, disrupting SPS’s microwave or laser transmission beam, either by interfering directly with the beam or its pilot signals, or by changing its position so that it misses its receiving antenna, would be a highly effective way to attack the SPS. Since the effects would be temporary and reversible, such an attack might be favored in crisis situations short of all-out war. Disruption using metallic chaff would be ineffective against a microwave beam, due to its very large area. Laser beams could be temporarily deflected by clouds of small particles or by organic compounds that absorb energy at the appropriate frequency. Electronic interference possibilities for lasers or microwaves cannot be presently predicted. A missile attack with a conventional warhead might be difficult due to SPS’s very large size and redundancy. The most vulnerable spot on the reference and other photovoltaic designs would be the rotary joint connecting the antenna to the solar cell array. Laser transmitters would be more vulnerable due to their smaller size, though they would also be easier to harden. Attackers would be tempted to use nuclear weapons, either directly on the satellite, or at a distance. I n space a large (one megaton or more) nuclear blast at up to 1,000 km-distance could cause an electrical surge in SPS circuitry (the electromagnetic pulse (EMP) effect) sufficient to damage a photovoltaic S P S72 (though it would have no effect on a mirror-system). Such an attack would be particularly effective against a large SPS system, as it could destroy a number of satellites simultaneously. However, like an orbital debris attack, it has the problem of damaging all unhardened satellites indiscriminately within the EMP radius. Furthermore, any use of nuclear weapons would constitute a serious escalation of a crisis and might not be considered except in the context of a full-scale war. Could the SPS Be Defended? Defense of orbital platforms can be accomplished in three ways: 1) evasion; 2) hardening against explosive or electronic attack; 3) antimissiIe weaponry. All of the SPS designs being considered would be too large and fragile to evade an incoming attack. SPSs may be equipped with small station-keeping propulsion units but not with large engines for rapid sustained movement. Hardening against explosive or debris attack wouId require rigid and heavy plating. Such efforts would be prohibitively costly, except perhaps for a few highly vulnerable areas. Hardening against EMP bursts or electronic warfare would require heavier and redundant circuitry as well as devices to detect and block jamming attacks. If incorporated in SPS designs from the beginning, these might be sufficiently inexpensive to justify inclusion. Different designs may differ in their vulnerability to such attacks —the photoklystron variation, for instance, would be less susceptible to EMP than the reference design. Antimissile weaponry, whether in the form of missiles or directed-energy devices, could be placed on the SPS to defend against missile and satellite attack. Though potentially highly effective against incoming missiles, such weapons would be useless against long-distance nuclear bursts or remote lasers. Furthermore, they would have unavoidable offensive strategic uses against other satellites and intercontinental ballistic missiles (ICBMs), and would hence invite attack. For these reasons major defensive systems are unlikely to be placed on civilian SPSs. Attacks would be more effectively deterred by political arrangements and by the use of separate military forces. Who Would Attack? In most instances an attack could only be carried out by a technically sophisticated nation with its own launchers and tracking systems. Threats by such a space-capable power against other space-capable powers —say by the U.S.S.R. against the United States—are possible in the context of a major crisis or actual war where the attacker is willing to risk the consequences of its actions. Threats against inferior or nonspace-capable states, such as SPS-using LDCs, might be made at a much lower crisis threshold. It is unclear which states will be capable of projecting military power into space over SPS’S lifetime. It is possible that technical advances will allow even small countries to purchase off-the-shelf equipment enabling them to attack an SPS, in the way that sophisticated surface- to-air missiles (SAMs) are now widely available to attack airplanes. However, it is more probable that, over the next 50 years, such capabilities will remain in the hands of the larger developed nations (including a number of countries that can be expected to enter this category in the future). The state of technology obviously bears on the question of whether terrorists or criminals could attack an SPS. Politically motivated terrorists are generally strong on dedicated manpower, not technical expertise. The SPS would be a symbolic high-visibility target, but terrorists would be more likely to attack SPS launch-vehicles, which would be vulnerable to simple heat-seeking missiles, than to threaten the SPS directly. However, a believable threat of direct attack by terrorists or small powers could be a spur to defensive measures such as hardening or antimissiIe devices, which wouId not stop an attack by a major power but might be effective against lesser threats. Sabotage of the SPS through the construction force, either for political purposes and/or for ransom, could not be ruled out. Careful screening of construction workers — who would be few in number— can be expected, along with supervision while in orbit. The unavoidable conditions of life and construction in space would make it difficult, especially at first, to smuggle explosives or sabotagedevices into orbit. However, a major expansion into space involving large numbers of personnel would, in the long run, provide opportunities for sabotage that probably cannot now be foreseen. Under current conditions any installation, in space or on the ground, is vulnerable to longrange missiles, or to dedicated terrorist groups. Reasonable measures to mitigate threats to SPS should be undertaken, but the dangers themselves cannot be eliminated. Current Military Programs in Space At present a number of nations use space for military purposes. The United States and Soviet Union operate the bulk of military satellites, but China, France, and a few other countries also have military capabilities. The preva lent uses involve satellites in low and high orbits for communications and data transmission, weather reporting, remote surveillance of foreign territory and the high seas, and interception of foreign communications. The crucial character of these satellites, especially in providing information on strategic missile placements and launches, is such that any future war between superpowers will undoubtedly include actions in space to destroy or damage enemy satelIites. 73 For these reasons both the United States and the U.S.S.R. are working to develop antisatellite (A-sat) weapons. The Soviets have in the past tested “killer satellites” capable of rendezvousing with objects in orbit and exploding on command. ” 75 The United States has not yet tested A-sat weapons in space but is developing a sophisticated orbital interceptor designed to be launched from an F-15 fighter. ” Neither system is capable of reaching geosynchronous satelIites without being placed on larger boosters, but such development is probably only a matter of time. The United States and U.S.S.R. have held informal talks in the past on limiting or banning A-sat weapons; the most recent such discussion took place in June 1979. These talks have been complicated by Soviet claims that the Space ShuttIe is an A-sat system. The talks are currently “on hold. ” An outgrowth of A-sat concern has been the rapidly increasing interest, on both sides, in laser and particle-beam weapons. ” Although some have predicted that such weapons couId be deployed within a few years (especially lasers, whose technology is more advanced than particle beams), most experts say that, if at all feasible, they will not be available until the end of the decade. High-energy lasers and particle beams are desirable because of their speed and accuracy– light speed for lasers, an appreciable fraction of that for particle beams–making them ideal for attacking fast-moving targets such as satellites and incoming missiles. They may be deployed on naval vessels, antiaircraft positions, and in space. Space-based directedenergy weapons ‘could theoretically attack satellites at great distances — up to a thousand miles — since their beams would not be attenuated and dispersed by the atmosphere. Most importantly, they could also be used to engage attacking ICBMs, providing an effective ABM capability that would radically change the strategic nuclear balance. Such uses depend on attaining very accurate aiming and tracking, and extremely high peak-power capabiIities. Use of SPS Launchers and Construction Facilities The most important military impact of SPS development would likely be military use of SPS launchers and construction facilities. In order to build an SPS it would be necessary to develop a new generation of high-capacity reusable lift vehicles to carry men and materials from the ground to low orbit. A second vehicle, such as an EOTV, would probably be used for transportation to geosynchronous orbit. In addition, techniques and devices for constructing large platforms and working effectively in space would have to be developed, along with life support systems and living quarters for extended stays in orbit. Improved and cheaper transportation would allow the military to fly many more missions, orbiting more and larger satellites and servicing these already in place. New construction techniques would enable large platforms for communications, surveiIlance, and/or directed- energy uses to be rapidly deployed. The military would have the further option of flying manned or unmanned missions. Without SPS, advanced launch-vehicles and construction devices may not be built or, at best, be done so much less quickly. The military may hence have a strong interest in participating in their development, as they have with the Space Shuttle. Whether the military would actively support the SPS in order to benefit from such developments might depend on whether they think SPS funding would direct resources away from other military programs. An ongoing SPS construction project with a high volume of traffic into space could provide opportunities for the military to disguise operations or incorporate them in normal SPS activities. Such a possibility would likely cause any unilateral SPS project to be closely monitored by foreign observers.

## 2NC Proliferation Link

### SBSP is seen for its potential dual-use, countries will protest because of the OSP

Betancourt ’10 (Space Based Solar Power : Worth the effort? Kiantar Betancourt ; August 28, 2010 ; Space Energy http://spaceenergy.com/AnnouncementRetrieve.aspx?ID=56407)

The idea of SBSP naturally raises serious questions concerning what norms of international law should be applicable to solar power satellites in space. These questions include property rights in space, rights of private parties, liability for damage, and coordination and registration of space objects. The general framework to answer these questions already exists, but further development will be needed. The United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) has led the development of this legal frame work. Presently there are three treaties relating to outer space significant to SBSP. The first and most significant is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space (Outer Space Treaty).[87] Second is the Convention on International Liability for Damage Caused by Space Object (Liability Convention).[88] Third is the Convention on Registration of Objects Launched into Outer Space (Registration Convention).[89] 1. Outer Space Treaty The Outer Space Treaty has been accepted and ratified by over 100 countries including all current space faring nations.[90] The Outer Space Treaty creates the fundamental base of outer space law under the idea that outer space is the common heritage of mankind.[91] Thus, the exploration and use of outer space shall be free for exploration and use by all states.[92] This means outer space, including the moon and other celestial bodies, is not subject to national appropriation by any means.[93] Thus, even for countries that currently lacks the resources to reach outer space, the right of exploration and use remains available to them as they become capable of space exploration. Though a state cannot claim ownership outer space or any celestial bodies within, a state on whose registry launches an object into outer space retains jurisdiction and control over that object.[94] The ownership of such objects in outer space is also not affected by their presence in outer space or by their return to earth.[95] Thus, countries, or companies that launch satellites on their state’s registry retain ownership of that satellite.[96] If no such ownership interest existed there would be no incentive to send a satellite into space that could be appropriated by another country or private party. The basic premise of the Outer Space Treaty involves actions by states. However it does contemplate the actions of private companies in two sections. First, parties to the treaty agree to bear international responsibility for national activities in outer space, whether those activities are carried out by governmental agencies or by non-governmental entities.[97] Second, states or their nationals are required to seek international consultation in circumstance that could cause harm to other states.[98] Though space exploration was dominated by states in 1968 the Outer Space Treaty still contemplated private companies joining the states in space travel. For the purposes of SBSP the Outer Space Treaty contains several other key provisions. The Outer Space Treaty specifically prohibits the placement of any objects in space carrying nuclear weapons or weapons of mass destruction.[99] Further, testing of any military weapons is strictly forbidden.[100] Though technically unfeasible, some fear SBSP could be transformed into a microwave death ray[101], such action would be in strict violation of the Outer Space Treaty.[102] The Outer Space Treaty also opens any station, installation, or equipment on the moon or other celestial body to inspection on a basis of reciprocity.[103] This provision, though limited to objects on other celestial bodies, allows countries to ensure other countries are following with the terms of the treaty. The Outer Space treaty answers two major questions concerning the right of private ownership and the role of private companies in outer space. The next two treaties answer the questions of liability and registration of objects in space. security of SBSP.

### And, Other countries will watch the SSP development

Gibbons, Director of the OTA, 81 (John, “Solar Power Satellites,” NTIS order #PB82-108846, August)

Military issues are intimately related to space and international considerations. Proponents stress that SPS microwave and mirror systems would be ineffective weapons and no more vulnerable than a terrestrial powerplant. While some believe that a military presence in space is unavoidable, it is clear that there are better ways to achieve military competence than with SPS. A primary concern for opponents is that SPS would provide a technological base that would further military capabilities and serve to escalate military conflicts. 114 Many opponents feel that, like the shuttle, military involvement with SPS is inevitable and that because of its vulnerability, SPS would accelerate the need for a military presence in space. Opponents are also concerned that because of their highly centralized nature, SPS satellites and receiving stations would be targets for attack from terrorists and hostile nations. It is likely that the military issue will be of great concern to the public, although it is not apparent how the military implications of SPS would be viewed. For example, a perceived military potential of SPS and its supporting infrastructure might be seen as a real benefit to a public concerned about both national security and energy needs. 5 Many might even expect a military presence in space. The laser system would probably engender more concern over military applications than the microwave or mirror designs. Clearly, future opinion will be influenced by the state of space weaponry in this and other nations, future agreements about the use of space, and the state of terrestrial weapons as well as arms limitations and the perceived military stature of the United States relative to the rest of the world.

## 1NC Spending Link

### High costs and long gestation period

Bansal 2011 (Gaurav May 23rd, 2011. Ph.D. Student in Mechanical Engineering

Rackham Predoctoral Fellowship The Good, the bad and the ugly: Space based solar energy http://www.ecofriend.com/entry/the-good-the-bad-and-the-ugly-space-based-solar-energy/)

Development cost for solar panels of that magnitude would be very large and will also take long time to manufacture as even the first space-based solar project passed California State also has gestation period of 7 long years. Similarly, costs to operationalize even a single large panel is very high, which makes it even more difficult for poor nations to do so. such pilot project by Japan also even runs into more than 20 billions of dollars even before operationalization.

## 2NC Spending Link 1/2

### Alternative energy on a massive scale is overwhelmingly expensive (Spending Link)

Hoffman 11 (“The Cost of Running the World on Renewable Power” Wednesday, 09 March 2011 17:27 Doug L Hoffman author of The Resilient Earth found at the Global Warming Policy Foundation - http://www.thegwpf.org/best-of-blogs/2611-the-cost-of-running-the-world-on-renewable-power.html)

Green advocates and climate change alarmists alike insist that the world shift to using only non-polluting, renewable energy sources, and the sooner the better. What is seldom mentioned is the enormous cost of retooling the world's energy infrastructure to use intermittent, unreliable wind and solar energy. A recent two part paper, appearing in Energy Policy, makes a reasonable attempt at stating the requirements to fix humanity's fossil fuel addiction and go all green. The analysis found that, to provide roughly 84% of the world's energy needs in 2030, would require around 4 million 5 MW wind turbines and 90,000 300 MW solar power plants, with the remaining 16% coming from solar photovoltaic rooftop systems, geothermal, tidal, wave and hydroelectric sources. Some quick back-of-the-envelope calculations show why the world economy cannot afford to go totally green. Most of the financial figures given for renewable energy are carefully chosen to show green energy in a positive light. The facts are renewable energy is still much more expensive than conventional electrical generation. And to be accurate, government subsidies and grants cannot be used to discount the cost because, in the end, it is the total cost to society that counts. Whether a power company, the government or consumers pay it all costs the economy. Looking at generation costs without considering initial purchase, installation and integration costs are also misleading. Quite frankly, there is no way the cost of WWS would be similar to energy cost today based on initial purchase cost alone. The solar component calls for the use of industrial scale concentrating solar plants, the most cost efficient form of solar power. Abengoa Solar, a company currently constructing solar thermal plants, put the cost of a 300 MW plant at 1.2 billion euros in 2007. In 2009, the Arizona state government announced a 200 MW plant for 1 billion US dollars so let's split the difference and estimate $1.56 billion per plant. Calculating the total cost for world solar power: 90,000 \* $1,560,000,000 = $140 Trillion It should also be noted that the above costs are without the necessary, continent spanning power grids needed to match spotty wind and solar power with demand. It has been estimated that to upgrade the US power grid to accommodate renewable energy sources will cost $2 trillion over the next 20 years. While a system using nuclear power will undoubtedly need to be expanded in the future, because nuclear is baseload power (i.e. steady), it would not require the extra expense of intermittent sources such as wind, solar or wave. If we use total population as an indication of demand, and hence grid infrastructure need, this adds another $45 trillion to the WWS requirements. The total bill for WWS comes to around $225 trillion over the next 20 years. That is nearly the entire output of the world's largest economy every year for two decades. Greens will say that once the system has been converted the energy costs drop, after all wind and sunshine are free. True, but fuel costs for nuclear power are also very low, and $150 Trillion will by a lot of uranium and thorium. And we know nuclear power works safely and reliably, the same cannot be said of renewable power generation on the scale being proposed. Aside from the mind-boggling cost, WWS, as proposed by Jacobson and Delucchi, requires new, unproven technologies, rapidly falling manufacturing prices, and international cooperation unheard of today. Given the havoc caused by [natural gas supply interruptions](http://theresilientearth.com/?q=content/crank-week-january-5-2009-vladimir-putin) caused by Russia, would any sovereign nation trust a power grid that spans three continents and thousands of miles? A power grid that could be disrupted by terrorists or maniacal despots anywhere along its major arteries? Any way you look at renewable energy, it makes little sense. Perhaps the best way to look at running the world exclusively on renewable power is that it would cost $33,500 for every man, woman and child on Earth. People in developed nations might be willing to invest this much, but what of those living in under developed economies, where per capita yearly income can be less than $300? Nobody but deep green zealots would call this a reasonable deal. If you are interested in a workable plan using currently available technology, pick up a copy of [The Energy Gap](http://www.amazon.com/Energy-Gap-Preserve-Environment-Civilization/dp/145360717X/). The world's future energy needs can be met while reducing pollution and without bankrupting everyone on the planet—it just cannot be done using wind and solar energy. Be safe, enjoy the interglacial and stay skeptical.

2NC Spending Link 2/2

### Cost, inefficiencies, and frequency interference are the main barriers to SBSP

Ramos, Major in the USA Military, 2000, (Kim, Air Command and Staff College Air Univeristy, “Solar Power Constellations Implications for the United States Air Force “,<http://www.nss.org/settlement/ssp/library/2000-SolarPowerConstellations.pdf>, DOA: 7/25/11)

Current barriers to implementation are the cost for the system, the high cost of launch services, solar cell inefficiencies, and possible communication frequency interference. The type of solar power satellite architecture proposed has a lot to do with cost. Regardless of the architecture all the designs are on an order of several billions of dollars. This price tag has a tendency to scare away potential investors. The high cost of launches contributes to that estimate. Until the price per pound to put a payload in orbit comes down, this will continue to be a barrier. In addition to cost, the inefficiencies of solar cells are also a barrier to implementation. Solar cells, the main method for harnessing solar power currently have efficiencies in the range of 20%. This means that the solar arrays must be kilometers in size to generate enough power worth beaming back to earth. The final barrier to implementation is frequency interference. In the arena of communications, before scientists conducted experiments, many supposed that there was a potential for interference from the beam on communications systems, radar, and aircraft communications in the geographic area of the beam. 21 A Japanese study conducted in 1993 demonstrated that a high power microwave beam would not be strong enough to interfere with telecommunications 22 However, most of the articles and research supporting solar power satellites still list frequency or communications interference as an issue to resolve.

### SBSP costs too much

Betancourt ’10 (Space Based Solar Power : Worth the effort? Kiantar Betancourt ; August 28, 2010 ; Space Energy http://spaceenergy.com/AnnouncementRetrieve.aspx?ID=56407)

The biggest challenge to SBSP is the high launch costs of getting its satellites into space. At current rate launching payloads into low-earth orbit costs $6k to $10k per kilogram.[77] The cost of SBSP at that rate would well exceed the cost of coal powered electricity of 8-10 cents per kilowatt.[78] Without any further improvement to current technology, to supply power at 8-10 cents per kilowatt, launch costs would need to fall as low as $440 per kilogram.[79] As the private space industry expands costs are expected to fall significantly in the coming decades.[80] Virgin Galactic, founded by Sir Richard Branson, and SpaceX, founded by Elon Musk, are two such companies working to lower to the cost of space travel.[81] SpaceX’s Falcon 1 rocket successfully reached orbit for the first time in Sept. 2008.[82] The company is developing a much larger rocket, Falcon 9, which will be capable of carrying payloads up to 12 tons into orbit.[83] Mr. Musk estimates the Falcon 9 could bring the launch costs down to $3k per kilo, and with reuse of each launcher eventually down to $1k per kilo.[84] High initial launch costs could also be alleviated if they were distributed amongst a larger group of participants joined by their interest in creating SBSP. If the NASA, ESA, and JAXA worked together the initial startup costs of SBSP could be distributed and would not place as great a burden on the individual parties. Such cooperation is not unprecedented. The International Space Station, a joint effort of 16 countries, has cost the U.S. and its partners over $100 billion dollars over the past 15 years.[85] A similar effort, for a price tag closer to 10 billion could see the development of the first prototype of SBSP.[86] If JAXA or a private company are able to complete the first working prototype the argument for SBSP will become even stronger. Prohibitive launch costs remain the number one technical and financial barrier to SBSP though it seems over time this problem will diminish. Improving the international legal framework governing space law is of equally important to the realization of SBSP.

## 1NC TSPS Counterplan

### The United States federal government should develop and demonstrate Thunderstorm Solar Power Satellites.

### It’s a more defensible intermediate step than the plan and avoids the links to politics

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

The continued extreme use of fossil fuels to meet world energy needs is putting the Earth at risk for significant climate change. In an uncontrolled experiment, the buildup of carbon dioxide and other greenhouse gases is apparently affecting the Earth’s climate. The global climate is warming and severe storms such as hurricanes and tornadoes are getting worse. Alternatives to fossil fuels may reduce the addition of carbon dioxide to the atmosphere. Space Solar Power, from orbiting satellites, provides an option for clean, renewable energy that will reduce the pressure on the Earth’s environmental system. Uncertainty in the cost of commercial power from space has been the principal issue inhibiting investment support by the power companies. Geoengineering is defined as the use of technology to interact with the global environment. A Solar Power Satellite represents a capability for considering geoengineering concepts. The Thunderstorm Solar Power Satellite (TSPS) is a concept for interacting with thunderstorms to prevent formation of tornadoes. Before weather modification can be safely attempted, the fine structure of thunderstorms must be computer simulated and related to tornadogenesis. TSPS benefits are saving lives and reducing property. These benefits are not as sensitive to the system economics as the commercial solar power satellite and can be used to justify government investment in space solar power. The TSPS can develop and demonstrate the technology and operations critical to understanding the cost of space solar power. Consequently, there is no direct competition with fossil fuel based power supplies until SSP technology and operations have been demonstrated.

## 2NC Solvency 1/2

### And, Even the smallest investments in SSP face overwhelming obstacles- TSPS is the best way to generate confidence and investments

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

Solar energy is a resource that meets the criteria of sustainability. Collecting the energy in space provides significant advantages in continuity of supply, although its development presents many obstacles [9]. Currently, space solar power ideas lack credibility with many observers because of the scope, size, and cost of the system needed to produce useful quantities of electricity[12]. Skeptics cite the technical challenges, the cost estimates from older studies and the investment required before useful levels of power are produced [5]. Specifically, there will be a huge initial cost prior to getting any return on the investment. The Fresh Look at Space Solar Power Study [10] defined concepts with lower initial investment. But the estimated cost per kwhr is still not competitive with fossil fuel energy production. Access to space, launch cost, drives the cost of the space components. The current rates, dollars per pound of payload to orbit, are nearly two orders of magnitude too high to challenge the fossil fuel rates for electricity production. Most technology and processes essential to SSP have been demonstrated on earth and in space. There are no technical breakthroughs needed to implement the system [Ref 10]. These technologies and operations must be refined and characterized to understand efficiencies and to provide increased confidence in SSP. TSPS is proposed as a means to reduce investment risk.

### And, TSPS is a smaller transition program- Eliminates all major obstacles to SSP

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

The research on understanding the impact of human activities on the global environment is finally influencing decisions by governments. There is a developing consensus that global warming is occurring and that it is the result of human activities [2]. Still there continues to be some uncertainty in the results of the research. The strong commitments needed to counter the buildup of C02 in the atmosphere are difficult to obtain. One major obstacle is the relative cost of clean renewable energy generation to the cost of fossil thels [11]. Space Solar Power (SSP) can be considered as a primary base load source of electricity for the power grid. Also, it could be a source of energy for production of hydrogen, a carbon-free fuel. Major impediments to SSP development are the expense and technical risk of building the satellite system. The TSPS proposed as a transition program. The primary function of TSPS would be weather modification to prevent formation of tornadoes. These satellites would convert solar radiation to electricity. They would also be equipped to generate intense, steerable beams of 26 Ghz to 96 Ghz radiation. These beams would manipulate the fine structure of weather systems by heating of raindrops at strategic locations within the weather systems. When not in use for weather control, the satellites beam the power to rectennas on earth. Although minimal size to keep implementation costs down, they could contribute to electricity production. However, their demonstration of technology and operations could be a factor in further investment in space solar power.

2NC Solvency 2/2

### And, TSPS is the best strategy for SSP- It secures commercial investment

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

The key strategy is the early involvement of the commercial energy industry in the concept of Space Solar Power. The development and operation of TSPS will show the commercial energy industry the capability and cost parameters that can reduce the risk of investment in space solar power. Implementation of Space Solar Power is a means for reducing the potential of global environmental change.

## 2NC Politics Net-benefit 1/2

### And, TSPS provides political cover that SSP can’t match- It’s a smaller initial investment with more popular benefits

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

Enormous investment at considerable financial risk is needed before the first saleable kilowatt is available to the power grid from a solar power satellite. Preventing tornadoes with TSPS provides direct benefits, saving lives and reducing property damage. With social objectives to draw government support, this concept enables technology and space infrastructure development. Thus, SSP can obtain an initial development funding without competing directly with the low cost of electricity from fossil fuels. This theme of a staged cost/capability development is implicit in this approach.

### And, TSPS is more politically attractive now but helps SSP just as much

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

The fundamental concept depends on affecting of the convective forces in a thunderstorm [13]. Through eliminating tornadoes, the subsequent loss of life and destruction of property are reduced. Such benefits are attractive to politicians and are not as sensitive to the system economics as the commercial solar power satellite. However, once the fundamental technology and operations have been demonstrated, the cost and risk of energy production from space can be realistically assessed. This can be expected to lead to investment by energy suppliers.

### And, TSPS is a tricky way to create SSP without the political repercussions

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

1. OBJECTIVE The objective is defining systems level considerations in addressing a primary issue of global climate change. The potential impact of increased greenhouse effect on the global environment sets a need for action. A geoengineering level option of space solar power(SSP) is proposed as a way to mitigate the buildup of CO2. Further, the TSPS concept is introduced as beneficial means to develop and demonstrate essential SSP technology, operations and infrastructure. The paper attempts to deal with what Norm Augustine has described as “a far more complex kind of system-a system dominated by social, political and economic considerations.” [16]

2NC Politics Net-benefit 2/2

### And, TSPS gives the government a safe justification and side-steps the debate over fossil fuels

Eastlund, Bachelor’s of Science in Physics from MIT, NASA and FEMA have funded his weather control papers, Special Achievement Awards from the U.S. Atomic Energy Commission, Certificate of Recognition from the House of Representatives for his work on homeland security, Founder of Eastlund Scientific Enterprises Corp, and Jenkins, 38 years experience as systems engineer for NASA, MS in Civil Engineering from UC Berkeley, 2k4 (B.J. and L.M., March 8-15th, “Geoengineering Vision- Applications for Space Solar Power”, Proceedings of The 4th International Conference on Solar Power from Spac<http://adsabs.harvard.edu/abs/2004ESASP.567..275E>)

The TSPS concept has the potential to save lives and reduce property damage. This gives the government a justification for development of the system and avoids the issue of competing with the cost of fossil fuels. Control of the weather is a complex issue because there maybe adverse consequences from interacting with the chaotic system that is the earth’s atmosphere. The key to this potential for interaction is the sensitivity to small perturbations [14]. This same sensitivity makes prediction of the range of effects a problem. Even so, the specific phenomena of a tornado vortex could be eliminated with confidence. Adverse side effects are unlikely. Only about 20% of the supercell thunderstorms form tornadoes. If that 20% are “normalized” there should be little overall change in the weather.

## 1NC Anchor Tenant Counterplan

### The United States federal government should demonstrate space-based solar power satellites. The Department of Defense should offer, through formal agreement, to become an anchor tenant for commercial power beamed from space.

### Federal investment for an in-space tech demonstration is the key catalyst

National Security Space Office, 2k7 (Oct 10th, Report by NSSO’s Advanced Concepts Office in conjunction with the world’s top 170 SBSP experts, “Space-Based Solar Power As an Opportunity for Strategic Security”, <http://www.nss.org/settlement/ssp/library/nsso.htm>)

FINDING: The SBSP Study Group found that individual SBSP technologies are sufficiently mature to fly a basic proof‐of‐concept demonstration within 4‐6 years and a substantial power demonstration as early as 2017‐2020, though these are likely to cost between $5B‐$10B in total. This is a serious challenge for a - 22 - capable agency with a transformational agenda. A proposed spiral demonstration project can be found in Appendix B. • No government or private entity has ever completed a significant space‐borne demonstration, understandable to the public, to provide proof‐in‐principle and create strategic visibility for the concept (the study group did discover one European commercial consortium that was attempting to build a MW‐class in‐space demonstration within the next 5 years). While a series of experiments for specific component selection, maturation, and space qualification is also in order, a convincing in‐space demonstration is required to mature this concept and catalyze actionable commercial interest and development. There are also critical concept unknowns that can only be uncovered by flying actual hardware. o Recommendation: The SBSP Study Group recommends that the U.S. Government should sponsor a formally funded, follow‐on architecture study with industry and international partners that could lead to a competition for an orbital demonstration of the key underlying technologies and systems needed for an initial 5‐50 MWe continuous SBSP system.

### And, Their authors conclude you should do the counterplan

NSSO 10-10-7 (National Security Space Office, Report to the Director, “Space-Based Solar Power As an Opportunity for Strategic Security; Phase 0 Architecture Feasibility Study,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf)

Investors and the commercial sector have concerns that still need to be addressed. They need to believe that SBSP is technically possible and that the necessary technologies to make it economically viable are at a sufficient stage of readiness that they can go out and purchase them, should they choose to become involved with SBSP. Intellectual property rights and frequencies for power beaming must be protected. Demonstrations and proofs of concepts are needed. Until business is confident this is practical and doable (and not just technically feasible assuming that various technologies mature) and that it can buy or make the components necessary, it will likely just watch but not act. Incentives would help. These could include loan guarantees, availability of balloon loans (where interest payments are deferred until the SBSP system is operational), transferable tax credits, subsidies similar to those already in existence for other alternative energy sources, energy pre-purchase agreements, and/or tax holidays on the sale of the power. The commercial sector needs to see profit potential within a reasonable time frame. Electric utilities understand the need for large amounts of capital for infrastructure development. This can be acceptable as long as the payback is large and for an extended period. The payback period and rate of returns must be attractive after the amortization of the infrastructure costs. Public/private partnerships are a possibility but may not be needed. As strictly commercial SBSP corporations develop the confidence in the technologies and in the business case, they would prefer to proceed without government intervention or partnership. Having the government as a guaranteed customer for the power would reduce the risk for a commercial SBSP enterprise and could help with the availability and terms of financings.

## 2NC Solvency – Demonstration

### A demonstration creates private investment- Solves all barriers

National Security Space Office, 2k7 (Oct 10th, Report by NSSO’s Advanced Concepts Office in conjunction with the world’s top 170 SBSP experts, “Space-Based Solar Power As an Opportunity for Strategic Security”, <http://www.nss.org/settlement/ssp/library/nsso.htm>)

The second camp, primarily established private industry, felt that absent a clear demonstration of the viability of Space‐Based Solar Power, an adequate launch market would not exist to justify the expense; however, if the technical viability and markets for SBSP were demonstrated, private industry would respond on its own and the lift problem would take care of itself.

### A demonstration spurs rapid tech progress towards SSP

National Security Space Office, 2k7 (Oct 10th, Report by NSSO’s Advanced Concepts Office in conjunction with the world’s top 170 SBSP experts, “Space-Based Solar Power As an Opportunity for Strategic Security”, <http://www.nss.org/settlement/ssp/library/nsso.htm>)

Space Solar Power Satellites are very large structures and require substantially greater lift and in‐space transportation than has ever previously been attempted. Consequently, they also require a significantly expanded supporting infrastructure. The International Space Station is currently the largest structure in space with a mass of 232 MT, at an orbit of only 333 km. It has the largest solar arrays in space, with a total power of approximately 112 kW. In contrast, a single Space Solar Power Satellite is expected to be above 3,000 MT, several kilometers across, and most likely be located in GEO, at 42,124km, likely delivering between 1 to 10 GWe. From the perspective of today’s launch infrastructure, this may seem unimaginably large and ambitious, but in another sense it is well within the relative scale of other human accomplishments which at their time also seemed astounding creations‐‐the Eiffel Tower is 8,045 Tons; the Sear’s Tower 222,500 tons; the Empire State Building 365,000 – 392,000 tons, the largest of our supertankers is 650,000MT, and the Great Pyramid at Giza is 5,900,000 MT. Contemplating a space solar power satellite today is probably analogous to contemplating the building of the large hydro‐electric dams, which even today cause observers to marvel. Today the United States initiates less than 15 launches per year (at 25MT or less). Construction of a single SBSP satellite alone would require in excess of 120 such launches. That may seem like an astounding operations tempo until one considers the volume of other transportation infrastructure. For instance, in 2005, Atlanta International Airport saw 980,197 takeoffs & landings alone, an average of 1,342 takeoffs/day, or about 1 every minute 24 hours a day. In the same year, Singapore’s 41 ship cargo berths served 130,318 vessel arrivals (about 15 per hour), handling about 1.15 billion gross tons (GT), and 23.2 million twenty‐foot equivalent units (TFUs). Technology adoption can move at astounding speeds once a concept has been demonstrated and a market is created. Who would have imagined that barely 100 years after the single wood & cloth, 338 kg Wright Flier flew only 120 feet at a mere 30 mph, that the world would have fleets of thousands of jet‐powered, all‐metal giants weighing as much as 590,000 kg cruising between continents at close to the speed of sound? Who, as the first miles were being laid, would have foreseen the rate at which railroads, highways, electrification or communications infrastructure would grow? SBSP calls mankind to look at the means to achieve orbit and in‐space maneuver differently—not as monuments in themselves, but as a utilitarian infrastructure purposefully designed to achieve a very worthwhile goal. FINDING: The SBSP Study Group universally acknowledged that a necessary pre‐requisite for the technical and economic viability of SBSP was inexpensive and reliable access to orbit. However, participants were strongly divided on whether to recommend an immediate, all‐out attack on this problem or not. - 31

## 2NC Solvency – Private Sector

### SpaceX can launch Space based solar panels for a fraction of the cost

Fan, Martin, Wu, & Mok, 6/2/11, (William, Harold, James, Brian, Cal Tech, “Space Based Solar Power”, http://www.pickar.caltech.edu/e103/Final%20Exams/Space%20Based%20Solar%20Power.pdf, DOA:7/25/11)

Some important aspects have changed that could lead to SBSP evolving from a futuristic fantasy into a current, plausible reality. First is the advent of private space launch companies. The most famous one is SpaceX, which aims to launch objects into space at a fraction of the current costs. The other is the wireless revolution. Such widespread use has allowed wireless power transmission to take dramatic leaps forward, and as a consequence, provided a plausible solution to the issue of transmitting power from space onto the surface of the Earth. In this report, we introduce some of the technological aspects of SBSP. However, we will be focusing on laying down the economic groundwork for SBSP. We obtain linearized trend data for various factors that affect the marginal cost of SBSP (primarily solar panel efficiency, orbital transport costs, and energy demand and cost). We determined that it is actually infeasible to begin work on SBSP, as the marginal costs do not provide an adequate annual return for us to recommend SBSP

### SBSP is cheaper through privatization, solves for US economy

Poole, American public policy analyst, editor, and writer, 1988, (Robert Jr, ISIL, “Privatization: Providing Better Services With Lower Taxes”, <http://www.isil.org/resources/lit/privatization-english.html>, DOA: 7/25/11)

Why does privatization lead to lower costs and more efficient operations? The fundamental reason is the difference in incentives between public and private sectors. A tax-funded government agency differs profoundly from a business. The former has a legally-guaranteed monopoly on its services (e.g., picking up a city's garbage). It is guaranteed its revenues, regardless of performance. And its workers are protected both by unionization and by a civil service system which virtually guarantees continued employment and pay increases, regardless of performance. In sharp contrast, a private firm in a competitive market must win over its customers by offering them a superior combination of performance and price. If it fails to deliver adequately, its customers can go elsewhere. Like the prospect of being hanged, the prospect of losing one's customers tends to concentrate the mind. Private firms producing public services – even firms which competitively win exclusive contracts for a number of years – therefore operate far more efficiently than government monopolies.

This may sound fine in theory, but what about the evidence? After all, public-employee union critics make the charge that privatization must lead to higher costs, since a private firm will have all the same expenses as the public agency it replaces – plus the added costs of advertising and profits.

The evidence shows overwhelmingly that the theory, rather than the unions' claim, is correct. Every controlled study comparing public versus private service delivery shows lower costs (for a given level of performance) for private enterprise. This includes nationwide studies of garbage collection in the United States (1976) and Canada (1985); of fire protection (1976, Arizona); public-works services such as street sweeping, pavement patching, and traffic signal repair (1984, Southern California); transit services (1986, US); school bus transportation (1984, Indiana); airlines (1977, Australia); naval ship repair (1978, US), and many others. In these statistically valid studies, the cost of government services is typically 30-40% to as much as 100% higher than private services.

## A2: Plan Doesn’t Buy Satellites

### The phrase space solar power means more than just the energy – It includes the actual satellites

Macauleya, of Resources for the Future, 2 (Molly, “An economic assessment of space solar power as a source of electricity for space-based activities,” Space Policy, Volume 18)

This research paper explores power systems in spacecraft economics and the alternative that may be offered by space solar power (SSP).1 SSP is a satellite or system of satellites that collect solar energy, convert it into usable electrical power, and then transmit the power to another spacecraft, or ‘‘customer’’. SSP might be thought of as a gas station or power depot for fueling other spacecraft. It would free spacecraft from having to carry their own power supply other than some backup for peak demand or emergencies. SSP has to date largely been considered a source of power for activities on Earth, but in-space activities may represent a potentially large market and perhaps be served by SSP sooner than terrestrial customers. In this report, we estimate the value of SSP for a variety of space-based uses that might arise in the next decade or two. We find that the potential market penetration of SSP that is, the willingness of potential customers to adopt a new power technology like SSP is promising although, like many future markets premised on new technology, somewhat uncertain. We base our estimates on interview surveys of spacecraft designers and operators and information in the literature on spacecraft power system design and cost. We find that potential customers have minimal installed base and stranded costs in their investment in existing power equipment, and they are accustomed to accepting new technologies. These characteristics sharply contrast with terrestrial power markets, where customers often resist new technology. However, some space customers, while amenable to substitutes for their current power systems, are also averse to taking risk, either actual or perceived, if a new technology has not been flight tested and otherwise proven reliable. The critical importance of power supply for space activities sharpens this risk aversion in the case of customer acceptance of SSP. For this reason, early SSP demonstration projects would be desirable to build the market. Of particular usefulness in introducing SSP to space markets and mitigating risk in the near term would be demonstration of SSP as a cofire power supply that is, as a supplement to work in tandem with, rather than fully substitute for, an existing power system on a spacecraft. We also discuss technologies now in development that are likely either to complement or to substitute for SSP. SSP is unlikely to be deployed for at least a few years, or maybe longer, and innovation in other power-related technologies lighter-weight spacecraft, more capable batteries, and increasingly efficient solar cells will meanwhile proceed apace. Hence, innovation in these technologies and their future operating costs will affect the future economic value of SSP. We briefly survey these technologies and recommend that SSP designers apprise themselves of their development through technical interchange meetings, working synergistically with complementary technologies and bearing in mind the future costs of competing technologies. Because we believe that SSP may someday be operated as a quasi-private or even fully private entity, we also discuss some possible institutional arrangements for SSP. These possibilities have implications for the financing of such a system. In this discussion, we draw from recent commentaries on deregulated electricity markets. There are several considerations that we do not address. We do not forecast values for SSP as a potential source of space propulsion or estimate the value of SSP for well-into-the-future activities that may find SSP useful, such as space manufacturing or space tourism. For such activities, SSP could offer advantages over alternative power systems. There may also be new activities that could not take place without an alternative like SSP. Our report also does not address engineering configuration, deployment, or cost estimates in building and operating an SSP for space-based activities. Our objective is to illustrate a method and offer estimates of the demand side of the equation, in the hopes that it will figure into engineering design and cost management on the supply side. We suggest that the next stage of economics research would be fruitfully paired with engineering discussions in a ‘‘technology meets the market’’ identification of economically optimal operating parameters through simulation models, detailed surveys, or other approaches. To this end, we also recommend that potential customers be at the table in future SSP discussions. In the next section, we describe SSP and spacecraft power systems. In Section 3, we discuss technologies that may compete with or complement SSP and thus define the future SSP market. In Section 4, we discuss possible institutional designs for the ownership and operation of SSP, arguing that these need not necessarily be government functions but could involve the private sector. We offer conclusions in Section 5.

## Aff – A2: Shale Gas Turn 1/2

### Even if it releases less CO2 in the atmosphere it’s worse because it contaminates ground water

Tom Gjelten ‘9 (“Water Contamination Concerns Linger For Shale Gas” <http://www.npr.org/templates/story/story.php?storyId=113142234>, 9/23)

Advances in technology have helped boost the growth of shale drilling in the United States over the past few years. But as the practice of harvesting natural gas embedded in shale rock deep below the Earth's surface has expanded, it has raised concerns about the impact this type of drilling has on the environment — especially on groundwater.

At issue is the practice of "hydraulic fracturing," which in combination with horizontal drilling is an essential part of the shale gas production process. The shale rock in which the gas is trapped is so tight that it has to be broken in order for the gas to escape. A combination of sand and water laced with chemicals — including benzene — is pumped into the well bore at high pressure, shattering the rock and opening millions of tiny fissures, enabling the shale gas to seep into the pipeline.

### Shale gas has already started contaminating water

Tom Gjelten ‘9 (“Water Contamination Concerns Linger For Shale Gas” <http://www.npr.org/templates/story/story.php?storyId=113142234>, 9/23)

Some landowners in shale gas areas, however, say the energy and environmental benefits of this new production are outweighed by the environmental risks it raises. NPR's Jeff Brady documented these issues in a report earlier this year.

Steve Harris, who resides near Dallas, told Brady that he noticed a foul odor coming from his tap water shortly after a gas company used hydraulic fracturing in a natural gas well near his house. Harris said he complained to the drilling company and to state authorities but without result.

"Basically, you get to the point where you think maybe everybody's working with the gas people and against the little guy," Harris said.

In 2008, a hydrologist found evidence of benzene contamination in a water well in Wyoming, in the vicinity of a large gas field. Residents near Dimock, Pa., have also complained of contamination of their water supply as a result of gas well drilling in their area. Dimock is in an area of Pennsylvania that sits atop the Marcellus shale formation, one of the largest in the country, and natural gas companies have been active there.

Critics of hydraulic fracturing suspect that the chemicals used in the process have somehow leaked into the groundwater supply. It has been difficult, however, to demonstrate a direct connection between these apparent instances of water pollution and the hydraulic fracturing procedures that have taken place nearby. Industry sources point out that the shale rock subjected to the fracturing is thousands of feet below the surface of the Earth, far below the aquifers that supply drinking water. Many layers of rock are in between. The well bores themselves are shielded from the surrounding earth by steel and cement casing.

Aff – A2: Shale Gas Turn 2/2

### Chemical contamination will cause water shortage

Nikkei weekly (Japan) 2006 (TORU MIYAZAWA and TORU SUGAWARA “Industry drenched in water problems” <http://e.nikkei.com/e/fr/freetop.aspx>, January 30, 2006 Monday)

Recent toxic spills highlight chronic, growing issue of rapid depletion of resources Untreated industrial effluent released into rivers has caused a string of emergency situations for drinking water, and growing industrial demand has only worsened the water shortage situation. For foreign companies making investments in China, the troubles with water have become a new form of risk that must be considered alongside the shortages of electric power and the other energy problems they face. We do not have to read very far back in the news archives to find stories about chemical spills disrupting the water supply to the people of China. On Jan. 6, people in Chongqing's Qijiang County noticed that the waters of the Qijiang River had turned red. The water-quality monitoring equipment of the local waterworks bureau also noticed the abnormality. An investigation revealed that a damaged wastewater pipe at an upriver chemical fertilizer plant had released 600 metric tons of sulfuric acid into the water. The accident forced some 30,000 people to go without water for two days. Tip of the iceberg A cadmium spill contaminated a river in Guangdong Province in December. And in November, newspapers around the world carried the story about the benzene spill in the Songhua River in Jilin Province. That catastrophe shut off the water supply to millions of residents of Harbin, and the benzene flowed all the way into Russia. But incidents that get reported like these appear to be only the tip of the iceberg. According to a Hong Kong newspaper, a study in Guangdong Province found that, of the arable land surveyed, more than half is contaminated with cadmium and other heavy metals, and that around 20% of the irrigation water is contaminated with mercury. In the sprawling metropolis of Chongqing where much of China's heavy industry is concentrated, some 70% of the factories lining the Yangtze River are said to be disgorging their wastewater straight into the river without treatment. Meanwhile, even contaminated water is getting harder to come by as citizens and factories alike face the growing problem of water shortages in China. China consumed 554.8 billion cubic meters of water in 2004, 4.3% more than it did in 2003. By 2030 its water consumption is expected to reach 700-800 billion cubic meters. The Ministry of Water Resources conducted a survey of the availability of water in 669 cities across China. What it found was that over 400 cities face water shortages and the situation is severe for 110 of them. The ministry has estimated that cities alone face a shortage of 6 billion cubic meters of water a year, and it had calculated that water shortages in factory operations results in economic losses of 10 billion yuan ($1.24 billion) a year. Eutrophication of polluted rivers leading to algae blooms that impede water intake pipes is an example of the way that river pollution exacerbates the problem of water scarcity. It also leads to higher fees for water services, which can throw off the cost structures of entire industries. In 2004, the price to industry for water services in Beijing rose 30% to 4.1 yuan per cubic meter. Prices are widely expected to rise further this.

### Shale gas drilling put dangerous chemicals into groundwater

Parker Waichman Alonso LLP ’11 (last date cited) (“Water Contamination form Shale Gas Drilling” http://www.water-contamination-from-shale.com/)

Hydraulic fracturing, the growing practice of drilling for the natural gas embedded in shale rock formations deep below the Earth’s surface, may be contaminating water in many places. Critics of hydraulic fracturing, or fracking, suspect that the chemicals used in shale gas drilling can leak into groundwater supplies. Landowners in shale gas drilling areas have reported foul smells in tap water, and toxic chemicals, such as benzene, have been detected in water from wells near drilling sites. In some cases, tap water can even be set aflame because it is contaminated with volatile chemicals because of shale gas drilling.

Many of the chemicals used in fracking, such as benzene, are hazardous. Long-term exposure to such chemicals can have serious health consequences. However, the industry has been reluctant to disclose the chemicals used in shale gas drilling, for fear of revealing proprietary information to their competitors. But people living near shale gas fracking operations have a right to this information, especially if any of these chemicals could poison surrounding water supplies.